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PAPER PRESENTED BY N. RAPPAPORT
(Please Print, Must be First Author)

SPECIAL INSTRUCTIONS:

Viscous Excitation of Coupled Librations Modes in Planetary Rings

N. Rappaport (ex Borderies) (JPL), P.-Y. Longaretti (Grenoble Obs.)

Viscous instabilitites can develop in a dense ring (Borderies, Goldreich and Tremaine, 1985, Icarus 63, 406-420). An analysis of viscous instabilities based on a two streamlines model shows that, within this simplified model, two regimes of instability exist. In the first regime, librations of the streamlines are excited and persist whereas the mean eccentricity of the ring is damped. In the second regime, the librations are damped whereas the mean eccentricity is driven to an equilibrium value depending on the details of the stress tensor model under consideration. The two regimes are differentiated by the value of the initial eccentricity.

Viscous excitation of coupled libration modes may be relevant to a number of unsolved problems in planetary rings. Examples are the rigid precession of non-circular and non-equatorial narrow rings, the unexplained large residuals of the η ring of Uranus, and the origin of the small scale structures of the B ring of Saturn.

We have written a program that allows us to study the dynamical evolution of streamlines in the presence of a superposition of libration modes. We will present preliminary results concerning the various instability regimes and the temporal and spatial behavior of the libration modes.

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